

REMARKS

Reconsideration of the present application is respectfully requested.

Objections to the Claims

The Examiner has objected to claims 1, 7, 17, and 20 based on an alleged informality. In particular, the Examiner asserted that the term “groove” was not an accurate label for the subject matter claimed.

Although Applicants assert that the term “groove” was adequately defined in their specification, they have amended claims 1, 7, 17, and 20 by this response to replace the term “groove” with “gap” wherever it appears. The term “gap” clearly indicates that it is formed by cutting a material all the way through.

Based on this amendment, Applicants submit that claims 1, 7, 17, and 20 are fully clear. Applicants therefore respectfully request that the Examiner withdraw the objection of claims 1, 7, 17, and 20.

Amendments to the Specification and Abstract

By this response Applicants have amended the specification and abstract to change the term “groove” to “gap” wherever it appears. This amendment is supported, for example, by originally-filed FIGs. 1-4 and associated portions of the specification. No new matter is added by these amendments.

Claim Rejections - 35 U.S.C. § 112

The Examiner has rejected claims 1-25 under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 19, 22, and 25, the Examiner has asserted that the term “bar shape” is vague and indefinite. By this response, Applicants have amended claims 19, 22, and 25 to recite that the driving beams each have a U-shape and the detection beams each have a straight bar shape. In particular, Applicants recite a “straight bar” to further define the properties of the bar shape. These terms are fully supported and described in Applicants’ specification is sufficient detail to allow one skilled in the art to understand the terms. (See, e.g., Applicants’ specification, from page 8, line 24-26, through page 9, line 8, and FIG. 1)

Regarding claims 1, 7, 20, and 23, the Examiner has asserted that it is unclear what the capacitive variation, the monitor electrode, the output electrode, and/or the detection means detect. By this response, Applicants have amended claims 1, 7, 20, and 23 to further define these elements.

In particular, Applicants have amended claims 1 and 7 to recite “an output electrode for outputting a signal indicative of capacitive variation based on vibration of said movable portion in said predetermined direction with respect to said output electrode,” Applicants have amended claim 7 to recite “a monitor electrode for monitoring capacitive variation based on vibration of said movable portion in said first predetermined direction with respect to said monitor electrode and supplying a monitor signal to said external circuit,” Applicants have amended claim 20 to recite a “detection means including a detection electrode for detecting capacitive variation with respect to said detection electrode based on vibration of said movable portion caused by supplying said drive signal to said drive electrode, said detection means including a detection electrode included in said fixed portion to output a detection signal indicative of said capacitive variation,” and Applicants have amended claim 23 to recite a “detection means for detecting capacitive variation based on vibration of said movable portion caused by supplying said drive signal to said drive electrode, said detection means including a detection electrode included in said fixed portion to output a detection signal.”

These claim amendments further define how the capacitive variation, the monitor electrode, the output electrode, and/or the detection means operate. In particular, taken in light of the description in the specification, the claims shown that the capacitive variation is defined based on vibration of the movable portion in the predetermined direction with respect to the output, monitor, and detection electrodes.

Regarding claims 1-25, the Examiner notes that there are numerous recitations of a wire being connected to an “external circuit substrate.” By this response, Applicants have amended the claims to clarify this. For example, claim 1 has been amended to recite a “semiconductor device electrically and mechanically connectable to an external circuit,” “an output wire connected to said output electrode and being connectable to said external circuit,” and “a shield wire connectable to a constant potential at said external circuit to provide capacitive shielding between said input wire and said output wire.” Similar amendments have been made to the other claims. These amendments make it clear that the external circuit is not a part of the recited invention. Rather, the recited invention is *connectable* to an external circuit.

However, as these amendments show, once the recited semiconductor device is electrically and mechanically connected to the external circuit, the recited device can use a drive signal supplied by an external circuit can and can provide the positional relation between the shield wire and the output wire, the monitor wire, the detection wire, and the input wire to shield the input wire.

In addition, Applicants have amended the claims such that the term “external circuit substrate” has been replaced with “external circuit” wherever it appears. Although the external circuit is not a recited element required by the claims, Applicants nevertheless have amended the claims to use this broader term.

Based on the above comments and claim amendments, Applicants submit that claims 1-15 are definite. Applicants therefore respectfully request that the Examiner withdraw the rejection of claims

1-25 under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim Rejections - 35 U.S.C. § 103

The Examiner has rejected claims 1-4, 6, 13, 14, and 16-25 under 35 U.S.C. § 103(a) as being allegedly unpatentable over United States Patent No. 5,969,225 to Kobayashi ("Kobayashi") in view of United States Patent No. 6,119,518 to Itou ("Itou").

By this Response, Applicants have amended claims 1, 7, and 13 to more clearly describe the recited semiconductor substrate structure. Amended claim 1 recites that a fixed portion of the semiconductor substrate comprises "a shield substrate arranged at peripheries of said movable portion, said input electrode, and said output electrode." Amended claim 1 further recites "a pad connected to said shield wire on said fixed portion at a location other than said input electrode and said output electrode between said input electrode and said output electrode to place said shield wire between said input wire and output wire having electrical insulation to shield said output wire from said periodical signal on said input wire with a predetermined positional relation therebetween when said semiconductor device is electrically and mechanically connected to said external circuit and to supply said constant potential to said shield substrate to shield said output electrode from said periodical signal on said input electrode when said semiconductor device is electrically and mechanically connected to said external circuit."

An exemplary embodiment of this is shown in Applicants' specification. The pad 71 is connected to the shield wire 70 on the fixed portion 20 at a location between the drive (input) electrode 40 and the detection (output) electrode 50 to place the shield wire between the input wire 42 and output wire 52 having electrical insulation to shield the output wire from the periodical signal on the input wire when the semiconductor device is electrically and mechanically connected to the external circuit with a predetermined positional relation therebetween. In this embodiment the pad 71

supplies the constant potential to the fixed portion 20 to further shield the output wire from the periodical signal on the input wire.

The Examiner acknowledges that Kobayashi lacks a specific teaching of shielding means to reduce crosstalk. Thus, this feature is not disclosed in Kobayashi. For this, the Examiner relies upon the teachings of Itou. However Itou does not disclose or suggest a shield substrate, as recited in claim 1, nor does it disclose or suggest the particularly recited placement of a shield substrate, also as recited in claim 1.

Itou discloses piezoelectric elements 131, 132, 133 and 134 that function as an oscillation exciting unit for exciting the oscillations of the oscillator 102, and upper electrodes 141, 142, 143 and 144 of a thin film electrode material that are formed on the upper faces of the piezoelectric elements. (See, e.g., Itou, column 12, lines 51-63, and FIG. 16B.) With the upper electrodes 141, 142, 143, 144, 151, 171 and 172 of those individual elements, respectively, there are connected wiring lines 181, 182, 183, 184, 185, 186 and 187 of a thin film conductive material such as aluminum, so that signals can be fed to or extracted from the individual electrodes. (See, e.g., Itou, column 13, lines 8-13, and FIG. 16B.)

In Itou, a disclosed feedback element 105 and its wiring line 185, and detecting piezoelectric elements 161 and 162 and their wiring lines 186 and 187 are shielded from the driving piezoelectric elements 131, 132, 133 and 134 and their wiring lines 181, 182, 183 and 184 by covering them with a shield film 109 made by using a thin film forming technique. (See, e.g., Itou, column 13, lines 20-26, and FIGs. 16A and 16B.) And shield films require an insulation material for coverage of the shield films. The Examiner appears to broadly interpret Itou's use of a shielding film 109 to teach "electrically isolating the driving terminals and the detecting terminals of an angular velocity sensor."

However, claim 1 specifically recites a shield substrate arranged at peripheries of said movable portion, said input electrode, and said output electrode. An exemplary embodiment of this

claim can be seen in Applicants' FIG. 1, which discloses a shield pad 71 arranged between a drive wire pad 41 for an input wire 42 and a detection wire pad 51 for an output wire 52, thus placing the shield wire 71 between the input wire 42 and the output wire 52 with no special insulation material required. This feature is not disclosed in Kobayashi or Itou, alone or in combination.

Claim 1 also recites that the shield frame, the input electrode, and the output electrode are coplanar. In contrast, Kobayashi discloses a substrate 2 that is not coplanar with a support section, support beams 5, 25, and electrodes 10A and 10B, 30A and 30B, 31A and 31B, 32A and 32B. (See, e.g., Kobayashi, from column 1, line 42, through column 2, line 34, from column 5, line 55, through column 7, line 8, and FIG.s. 1 and 7.) Itou, in turn, discloses that the feedback element 105 and its wiring line 185, and the detecting piezoelectric elements 161 and 162 and their wiring lines 186 and 187 are covered with a shield film 109. (See, e.g., Itou, column 13, lines 20-26, and FIG. 17.) Thus, neither Kobayashi or Itou, alone or in combination, disclose or suggest having a shield frame, an input electrode, and an output electrode be coplanar.

Claims 13, 20, and 23 each recite a semiconductor substrate including, on a plane, a fixed portion and a movable portion, said fixed portion comprising a shield substrate. Claim 17 recites a shield substrate arranged at peripheries of said moving portion, said input electrode, and said output electrode, and that the shield frame, the input electrode, and the output electrode are coplanar. They are each allowable for reasons analogous to those given above for claim 1.

In addition, claims 2-5, and 14 depend from claim 1 and are allowable for at least the reasons given above for claim 1; claim 16 depends from claim 13 and is allowable for at least the reasons given above for claim 13; claims 18 and 19 depend from claim 17 and are allowable for at least the reasons given above for claim 17; claims 21 and 22 depend from claim 20 and are allowable for at least the reasons given above for claim 20; and claims 24 and 25 depend from claim 23 and are allowable for at least the reasons given above for claim 23.

In addition, claims 14 recites that “said pad is arranged on said fixed portion to have predetermined distances to said input electrode and said output electrode to provide spatial distances for said capacitive shielding between said input wire and said output wire by said shield wire connected to said pad,” while claim 16 recites that to 16 recite that “said shield wire pad is arranged on said fixed portion to have predetermined distances to said drive electrode and said detection electrode to provide spatial distances for said capacitive shielding between said drive signal wire and said detection wire by said shield wire connected to said shield wire pad.” Nothing in Kobayashi or Itou, alone or in combination discloses or suggests this arrangement of a pad.

Amended claims 18, 21, and 24 recite that the driving beams and detection beams “are independently arranged.” Nothing in Kobayashi or Itou, alone or in combination discloses or suggests this feature. In Kobayashi, a single support beam 5, 25 is disclosed, which serves as the sole connection between a movable section 3, 23 and support sections 4, 24. (See, e.g., Kobayashi, FIGs. 2 and 8.) It does not disclose or suggest independently arranged driving beams and detection beams, as recited in claims 18, 21, and 24. Nothing in Itou cures this deficiency.

Claims 19, 22, and 25 each recite that “said driving beams and said detection beams have different shapes, said driving beams each having a U-shape and said detection beams each having a straight bar shape.” Nothing in Kobayashi or Itou discloses or suggests having independently arranged driving and detection beams each having different shapes, in particular the driving beams having a U-shape and the detection beams each having a straight bar shape.

Based on at least the arguments given above, Applicants therefore respectfully request that the Examiner withdraw the rejection of claims 1-4, 6, 13, 14, and 16-25 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kobayashi in view of Itou.

The Examiner has rejected claims 5, 7-12, and 15 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kobayashi in view of Itou, and further in view of United States Patent No. 6,445,195 to Ward ("Ward").

Claim 7 recites a shield substrate arranged at peripheries of said movable portion, said input electrode, said output electrode, and said monitor electrode, and that the shield frame, the input electrode, and the output electrode are coplanar. It is allowable for reasons analogous to those given above for claim 1. Ward does not cure the deficiencies in Kobayashi and Itou disclosed above.

The Examiner stated, "Ward teaches the use of pick-off electrode (monitor electrodes) to feedback positional information of the movable portion to correct and control the drive means". However, claim 7 features that the pad 71 is connected to the shield wire 70 on the fixed portion 12 at a location other than the input electrode 40, 41 and the output electrode 50, 51 between the input electrode and the output electrode to place the shield wire between the input wire and output wire and between the input wire and the monitor wire with electrostatic insulation.

These references fail to disclose this feature. Therefore, claim 7 is believed to be patentable over cited references.

Claim 5 depends from claim 1 and is allowable for at least the reasons given above for claim 1. Ward does not cure the deficiencies in Kobayashi and Itou disclosed above. Claims 8-12 and 15 depend from claim 7 and are allowable for at least the reasons given above for claim 7.

In addition, claims 5 and 12 each recite that said fixed portion further includes a dummy electrode adjacent to said output electrode and capacitively coupled to said input electrode for generating a dummy signal, and that a dummy signal wire is connected to said dummy electrode and said circuit substrate, said dummy signal including an induced component of said periodical signal and being supplied to said circuit substrate to be used to cancel another component of said periodical signal induced in said periodical signal.

The Examiner appears to assert that the dummy electrodes of claims 5 and 12, as recited, could read on any shielding electrode or other electrode. Hence, he does not give any weight to their intended function. In addition, the Examiner also asserts that it would have been obvious in view of Ward to use means for sensing the drive feed through to obtain a signal to null the feed through in the drive electronics.”

However, in the device recited in claims 5 and 12, the dummy electrode generates an induced signal of the input (i.e., drive) signal. Ward discloses the measured components by adjusting the amplitude of the drive signal. The induced components used in claims 5 and 12 are clearly different from the signal obtained by adjusting the amplitude of the drive signal because of phase or ratios of harmonic components, and so the waveform of the obtained signal is different. Using the amplitude adjusting scheme disclosed in Ward would not render the induction scheme of claims 5 and 12 obvious.

Based on at least the arguments given above, Applicant therefore respectfully requests that the Examiner withdraw the rejection of claims 5, 7-12, and 15 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Kobayashi in view of Itou and further in view of Ward.

New Claims

By this response, Applicants have added new claims 26-40. Applicants respectfully request that these new claims be entered and considered by the Examiner.

Conclusion

In view of the foregoing, Applicants respectfully submit that this application is in condition for allowance. A timely notice to that effect is respectfully requested. If questions relating to patentability remain, the examiner is invited to contact the undersigned by telephone.

Please charge any unforeseen fees that may be due to Deposit Account No. 50-1147.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brian C. Altmiller", written over a horizontal line.

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